MATHEMATICAL AND COMPUTER MODELLING

EDITOR-IN-CHIEF: Ervin Y. Rodin

List of Contents and Author Index

Volume 18, 1993



MATHEMATICAL AND COMPUTER MODELLING

Editor-in-Chief

Ervin Y. Rodin

Department of Systems Science and Mathematics Campus Box 1040, Washington University One Brookings Drive St Louis, MO 63130-4899, U.S.A. Tel.: 314-935-6007 or 935-5806 Fax: 314-935-6121 or 935-6007

rodin@rodin.wustl.edu uunet!wuarchive!rodin.wustl.edu!rodin rodin%rodin.wustl.edu@wugate.wustl.edu

Founding Co-Editor-in-Chief: Xavier J. R. Avula

Book and Survey Editor: D.N.P. Murthy, Department of Mechanical Engineering, University of Queensland, St Lucia, Brisbane, Qld 4067, Australia. e4murthy%uqvax.decnet.uq.oz.au@uunet.uu.net

Editorial Assistant: Florence A. Schick, Department of Systems Science and Mathematics, Campus Box 1040, Washington University, One Brookings Drive, St Louis, MO 63130-4899, U.S.A.

Publishing Office

Elsevier Science Ltd, Bampfylde Street, Exeter EX1 2AH, England [Tel. (0392) 51558; Fax (0392) 425370l.

Production Editor: Alison Seedhouse

Subscription and Advertising Offices

Enquiries from customers in North America should be sent to Elsevier Science Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.; and from the rest of the world to Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, England [Tel. (0865) 843000].

Published semi-monthly in 2 volumes

Second class postage paid at RAHWAY, NJ. Post-master send address corrections to *Mathematical* and Computer Modelling, c/o Elsevier Science Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.

Annual Subscription Rates

Annual Institutional Subscription Rate 1994. North, Central and South America, US\$1425.00, Rest of the World, £924.00. Sterling prices exclude VAT. Non-VAT registered customers in the European Community will be charged the appropriate VAT in addition to the price listed. Prices include postage and insurance and are subject to change without notice.

Back issues. Back issues of all previously published volumes, in both hard copy and in microform, are available direct from Elsevier Science offices.

Copyright © 1994 Elsevier Science Ltd

It is a condition of publication that manuscripts submitted to this journal have not been published and will not be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher if and when the article is accepted for publication. However, assignment of copyright is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and translations. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

Photocopying information for users in the U.S.A. The Itemfee Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided the stated fee for copying beyond that permitted by Section 107 or 108 of the US Copyright Law is paid. The appropriate remittance of US\$6.00 per copy per article is paid directly to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, U.S.A. [Tel. (508) 750 8400; Fax (508) 750 4744].

Permission for other use. The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying.

The Item-fee Code for this publication is 0895-7177/93 \$6.00 + 0.00

[©]TM The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

List of Contents

NUMBER 1

MULTIDIMENSIONAL INVERSE PROBLEMS AND MATHEMATICAL PROBLEMS OF TOMOGRAPHY AND SIGNAL PROCESSING

A. G. Ramm	ix Preface
	1. INVERSE PROBLEMS
A. G. Ramm	1 Property C and applications
S. Gutman and M. Klibanov	5 Regularized quasi-Newton method for inverse scattering problems
Y. V. Kurylev	33 Multi-dimensional inverse boundary problems by BC-method: Groups of transformations and uniqueness results
A. G. Ramm	47 Approximation by scattering solutions and applications to inverse scattering
A. G. Ramm and P. D. Stefanov	57 Fixed energy inverse scattering for non-compactly supported potentials
T. Schonbek	65 Uniqueness for a non-linear heat equation
M. Yamamoto	79 Conditional stability in determination of force terms of heat equations in a rectangle
	2. MATHEMATICAL PROBLEMS OF TOMOGRAPHY AND SIGNAL PROCESSING
A. I. Katsevich and A. G. Ramm	89 Multidimensional algorithm for finding discontinuities of signals from noisy discrete data
A. G. Ramm and A. I. Zaslavsky	109 Reconstructing singularities of a function from its Radon transform
	NUMBER 2
J. E. Angus	1 Some Consequences of Sensor Error in a Model for Passive Detection
TH. Shih and J. L. Lumley	9 Remarks on Turbulent Constitutive Relations
	 9 Remarks on Turbulent Constitutive Relations 17 Approximation of a Several Variables Function by a One Variable Function and Application to Global Optimization

C.-B. Tsay and J.-Y. Lin A Mathematical Model for the Tooth Geometry of Hypoid S. F. Abdinnour, 35 Models of Various Cell Structures in GT M. A. Venkataramanan and F. R. Jacobs Stationary and Nonstationary Iterative Methods for Nonlinear R. Shridharan and **Boundary Value Problems** R. P. Agarwal 63 Rothe Approximation to an Ablation-Transpiration Cooling B. Z. Guo Control System 75 Testing Advection Schemes in a Three-Dimensional Air J. Christensen Pollution Model 89 Global Stability Results of Epidemiological Models with D. Mukherjee, Nonlinear Incidence Rates J. Chattopadhyay and P. K. Tapaswi 93 Mathematical Analysis of the Model Arising in Study of C. Carasso and E. H. Hassnaoui Chemical Reactions in a Catalytic Cracking Reactor

NUMBER 3/4

ROTORCRAFT MODELLING: PART I

D. A. Peters	ix	Preface
M. V. Fulton and D. H. Hodges	1	Aeroelastic stability of composite hingeless rotor blades in hover—Part I: Theory
M. V. Fulton and D. H. Hodges	19	Aeroelastic stability of composite hingeless rotor blades in hover—Part II: Results
CJ. He and D. A. Peters	37	Optimum rotor interdisciplinary design with a finite state aeroelastic system
J. L. Walsh, W. J. LaMarsh, II and H. M. Adelman	53	Fully integrated aerodynamic/dynamic optimization of helicopter rotor blades
N. M. Komerath, J. M. Kim and S. G. Liou	73	Rotor wake interaction with separated flow
J. V. R. Prasad and A. M. Lipp	89	Synthesis of a helicopter nonlinear flight controller using approximate model inversion
A. Chattopadhyay, T. R. McCarthy and J. F. Madden, III	101	Structural optimization of high speed prop rotors including aeroelastic stability constraints
W. M. Stumpf and D. A. Peters	115	An integrated finite-state model for rotor deformation, nonlinear airloads, inflow and trim

Coupled rotor-fuselage vibration reduction using open-loop I. Papavassiliou, 131 P. P. Friedmann and blade pitch control C. Venkatesan Nonlinear aeroelasticity in rotorcraft D. M. Tang and 157 E. H. Dowell NUMBER 5 H. S. Green and T. Triffet **Artificial Neural Processing** Density Fluctuation in Brownian Motion and its Significance in B. Aebersold, K. H. Norwich and Olfaction W. Wong F. L. Litvin and J. Lu Computerized Simulation of Generation, Meshing and Contact of Double Circular-Arc Helical Gears A Model of Na-K Exchange During Nerve Excitation S. R. Vaccaro 49 Modelling of Forced-Ventilation Fires W. K. Chow A Dynamic Population Model of Parity Progression in Age J.-Y. Yu, J.-F. Xu and G.-T. Zhu Structure M. A. W. Mahmoud and Estimation of a Discriminant Function from a Mixture of Two 87 H. M. Moustafa Gamma Distributions when the Sample Size is Small Poisson Compounding of Dependent Random Variables: J. E. Angus A Stochastic Model for Total Claim Costs Composition Laws for Entropy and Temperature in Tree-Like G. Jumarie 107 Graphs **NUMBER 6** Recurrent Neural Networks for LU Decomposition and J. Wang and G. Wu Cholesky Factorization Can the Speakers of a Dominated Language Survive as I. Baggs and Unilinguals?: A Mathematical Model of Bilingualism H. I. Freedman A Statistical Approach to Consistency in AHP F. J. Dodd, H. A. Donegan and T. B. M. McMaster S.-H. Chen Weak Solvability of a Parabolic Equation Arising in Physical 23 Oceanography The Chain Multinomial Models of the HIV Epidemiology in W. Y. Tan Homosexual Populations Identification of Seasonality in Time Series: A Note A. M. Davey and 73 B. E. Flores The Particular Role of Cell Loss in Tumor Growth S. Markovitch 83 Comparison Between Different Mathematical Models for the S. S. E. H. Elnashaie and 91 S. S. Elshishini Simulation of Industrial Fluid Catalytic Cracking (FCC) Units

NUMBER 7

		NUMBER /
V. I. Znak	1	Some Models of Noise Signals and Heuristic Search for Weighted-Order Statistics
S. A. Maggelakis	9	Type α and Type β Transforming Growth Factors as Regulators of Cancer Cellular Growth: A Mathematical Model
T. L. Saaty and L. G. Vargas	17	Representation of Visual Response to Neural Firing
T. A. Porsching, C. A. Hall, T. L. Bennett and J. M. Ernsthausen	25	A Mathematical Model of Material Removal with Application to CNC Finishing
I. S. Sadek and J. Feng	41	Modelling Techniques for Optimal Control of Distributed Parameter Systems
F. A. Al-Khayyal, A. Houshyar and R. D. Markham	59	Literature Survey: The Current State of Knowledge in Modeling the AIDS Epidemic
W. W. Koczkodaj	79	A New Definition of Consistency of Pairwise Comparisons
M. E. Abashar and S. S. Elnashaie	85	Mathematical Modelling of Diffusion-Reaction, and Solution Algorithm for Complex Reaction Networks in Porous Catalyst Pellets—Steam Reforming of Natural Gas
F. Harary	101	Parallel Concepts in Graph Theory
W. W. Read	107	Errata to "Series Solutions for Laplace's Equation with Nonhomogeneous Mixed Boundary Conditions and Irregular Boundaries"
		NITIMBED 0
		NUMBER 8
H. T. Banks and C. A. Smith	1	Modeling and Identification of Material Parameters in Coupled Torsion and Bending
S. S. Wang and K. Huseyin	21	Bifurcations and Stability Properties of Nonlinear Systems with Symbolic Software
I. M. Sobol' and B. V. Shukman	39	Random and Quasirandom Sequences: Numerical Estimates of Uniformity of Distribution
M. H. Chang	47	A Probabilistic Model of Asset Growth for an Investment Portfolio
HQ. Tong	55	Evaluation Model and its Iterative Algorithm by Alternating Projection
R. R. Tsaih	61	The Softening Learning Procedure
B. F. Gray and G. C. Wake	65	Critical Initial Conditions for Thermal Ignition
S. Guellal and Y. Cherruault	77	A Mathematical Model of the Histamine Release

- K. E. Ahmad 83 Random Walk Density Function with Unknown Origin
 - Modelling—A Personal Viewpoint 93

R. Aris

95 Two Eyes Are Better Than One: Some Reflections on the Importance of Having More Than One Viewpoint in Mathematical Modelling and Other Disciplines

NUMBER 9

Blood Circulation Model

- A. Guettouche, C. Papapanayotou,
- Y. Cherruault,
- A. Azancot-Benisty and
- J. C. Challier
- T. Artikis, A. Voudouri and D. Jerwood
- 9 Analytical and Computer Simulation Techniques for a Stochastic Model Arising in Discounting Continuous Uniform Cash Flows

Optimization and Resolution Algorithm of the Human Fetal

- G. B. Reddy, S. S. N. Murty and K. Ghosh
- Timed Petri Net: An Expeditious Tool for Modelling and Analysis of Manufacturing Systems

- J. P. Pascal
- Unsteady Rotating Shear Flow of Power Law Fluids

B. Some

Some Recent Numerical Methods for Solving Nonlinear Hammerstein Integral Equations

L. Egghe

Consequences of Lotka's Law in the Case of Fractional Counting of Authorship and of First Author Counts

Y. Yavin

Suboptimal Nonlinear Filtering of the Rate of an Observed Point **Process**

Y. Yavin

- Recursive Estimation of a Discrete-Time Markov Chain
- C. Melolidakis
- Designing the Allocation of Emergency Units by Using the Shapley-Shubik Power Index: A Case Study
- F. C. Galiano and J. M. Montagna
- Optimal Allocation of Intermediate Storage in Multiproduct 111 **Batch Chemical Plants**

NUMBER 10

SIMILARITY, SYMMETRY AND SOLUTIONS OF NONLINEAR BOUNDARY VALUE PROBLEMS

- P. Broadbridge and
- J. M. Hill

xi Preface

G. Bluman

- P. Broadbridge,
- P. Tritscher and A. Avagliano
- Use and construction of potential symmetries
- Free boundary problems with nonlinear diffusion 15

Calculation of forced, nonlinear water waves in a square 35 P. J. Bryant container Nonclassical symmetry reductions of nonlinear partial P. A. Clarkson 45 differential equations J. N. Dewynne and Slender axisymmetric fluid jets 69 P. Wilmott A. Donato and F. Oliveri Reduction to autonomous form by group analysis and exact solutions of axisymmetric MHD equations M. J. Englefield 91 Reduction of equations using symmetries Generation of exact solutions to a class of quasilinear hyperbolic D. Fusco and 101 N. Manganaro models via reduction techniques P. E. Kloeden The uniqueness of classes of explicit solutions of boundary value problems T. R. Marchant Thermal waves for nonlinear hyperbolic heat conduction A. McNabb 123 Means action times, time lags, and mean first passage times for some diffusion problems J. J. Shepherd, C. Chiera Perturbation analysis of the helical flow of non-Newtonian 131 fluids with application to a recirculating coaxial cylinder and H. J. Connell rheometer E. O. Tuck 141 Suspended drops The Painlevé analysis and exact travelling wave solutions to M. Vlieg-Hulstman 151 nonlinear partial differential equations G. C. Wake and Multiplicity of solutions of a quasilinear elliptic equation in 157 M. J. Hood spherical domains R. O. Weber and 163 Finite-time blow-up in reaction-diffusion equations S. I. Barry 169 Abstract—Discrete Dynamical Systems with Pole-Type Orbits N. Joshi **NUMBER 11** A Survey of Fuzzy Clustering M.-S. Yang A Mathematical Model for Suspension Bridge Vibration **B.** Semper 17 Simulated Annealing: Practice versus Theory L. Ingber 29 I. S. Sadek, J. M. Sloss, 59 Nonprobabilistic Modelling of Dynamically Loaded Beams S. Adali and under Uncertain Excitations J. C. Bruch, Jr. A Coordinated Multicommodity (s,S) Inventory System

S. Kalpakam and G. Arivarignan

Control of Dynamic Routing in Networks with Markov Jump Y. Yavin and C. Frangos 75 **Parameters** A. L. Kovacs 87 Spatial Patterns in Nonequilibrium Hierarchical Systems Semidistributivity in the Heyting Arrow Lattice for Relational C. A. Leguizamón and 107 A. N. Zaretzky **Biologic Processes NUMBER 12** Nonsingularity of Some Classes of Matrices, and Minimal G. A. Heuer and U. Leopold-Wildburger Solutions of Silverman's Game on Discrete Sets Z.-Z. Shen, P. Drexel and A Mathematical Model of a Mesh System and Its L. Urbach Implementation A. I. Katsevich and Consistency of Rank Tests against Some General Alternatives A. G. Ramm The Simulation of Electrified Liquid Jets K. L. Kaiser, M. J. Kaiser and W. L. Weeks A Linked Risk Group Model for Investigating the Spread of P. C. Cooley, D. N. Hamilll, E. C. Liner, HIV L. E. Myers and C. M. van der Horst Y. Cherruault and 103 Decomposition Methods: A New Proof of Convergence G. Adomian Numerical Simulation of Discharged Waste Heat and L. Yu and S.-P. Zhu 107 Contaminants into the South Estuary of the Yangtze River

